

CLAIMS

1. A process for preparing microporous crystalline silicoaluminophosphate molecular sieves of CHA framework type, the process comprising:

(a) providing a reaction mixture comprising a source of alumina, a source of phosphate, a source of silica, hydrogen fluoride and an organic template comprising one or more compounds of formula (I):



wherein R is an alkyl radical of from 1 to 12 carbon atoms;

(b) inducing crystallization of silicoaluminophosphate from the reaction mixture; and

(c) recovering silicoaluminophosphate molecular sieve.

2. The process of claim 1, further comprising the step of (d) calcining the molecular sieve obtained in step (c).

3. The process of claim 1, wherein R is a linear alkyl group.

4. The process of claim 1, wherein R has from 1 to 10 carbon atoms.

5. The process of claim 4, wherein R has from 1 to 8 carbon atoms.

6. The process of claim 4, wherein R has from 1 to 6 carbon atoms.

7. The process of claim 4, wherein R has from 1 to 4 carbon atoms.

8. The process of claim 1, wherein the template is selected from one or more of the group consisting of: N,N,N',N'-tetramethyl ethylenediamine, N,N,N',N'-tetramethyl-1,3-propane-diamine, N,N,N',N'-tetramethyl-1,4-butanediamine, N,N,N',N'-tetramethyl-1,3-butanediamine, N,N,N',N'-tetramethyl-1,5-pentanediamine, N,N,N',N'-tetramethyl-1,6-hexanediamine, N,N,N',N'-tetramethyl-1,7-heptanediamine, N,N,N',N'-tetramethyl-1,8-octanediamine, N,N,N',N'-tetramethyl-1,9-nonanediamine, N,N,N',N'-tetramethyl-1,10-

decanediamine, N,N,N',N'-tetramethyl-1,11-undecanediamine and N,N,N',N'-tetramethyl-1,12-dodecanediamine.

9. The process of claim 8, wherein the template is selected from N,N,N',N'-tetramethyl ethylenediamine and N,N,N',N'-tetramethyl-1,4-butanediamine.

10. The process of claim 1, wherein crystallization takes place for a period of time of from 1 to 16 hours.

11. The process of claim 10, wherein crystallization takes place for a period of from 1 to 10 hours.

12. The process of claim 10, wherein crystallization takes place for a period of from 1 to 5 hours.

13. The process of claim 1, wherein crystallization takes place at a temperature of 175°C or less.

14. A process for preparing microporous crystalline aluminophosphate molecular sieves of CHA framework type, the process comprising:

(a) providing a reaction mixture comprising a source of alumina, a source of phosphate, hydrogen fluoride and an organic template comprising one or more compounds of formula (I'):



wherein R is an alkyl radical of from 3 to 12 carbon atoms;

(b) inducing crystallization of aluminophosphate from the reaction mixture; and

(c) recovering aluminophosphate molecular sieve.

15. The process of claim 14, further comprising the step of (d) calcining the molecular sieve obtained in step (c).

16. The process of claim 14, wherein R is a linear alkyl group.

17. The process of claim 14, wherein R has from 3 to 10 carbon atoms.
18. The process of claim 17, wherein R has from 3 to 8 carbon atoms.
19. The process of claim 17, wherein R has from 3 to 6 carbon atoms.
20. The process of claim 17, wherein R has from 3 to 4 carbon atoms.
21. The process of claim 14, wherein the template is selected from one or more of the group consisting of: N,N,N',N'-tetramethyl-1,3-propane-diamine, N,N,N',N'-tetramethyl-1,4-butanediamine, N,N,N',N'-tetramethyl-1,3-butanediamine, N,N,N',N'-tetramethyl-1,5-pentanediamine, N,N,N',N'-tetramethyl-1,6-hexanediamine, N,N,N',N'-tetramethyl-1,7-heptanediamine, N,N,N',N'-tetramethyl-1,8-octanediamine, N,N,N',N'-tetramethyl-1,9-nonanediamine, N,N,N',N'-tetramethyl-1,10-decanediamine, N,N,N',N'-tetramethyl-1,11-undecanediamine and N,N,N',N'-tetramethyl-1,12-dodecanediamine.
22. The process of claim 21, wherein the template is N,N,N',N'-tetramethyl-1,4-butanediamine.
23. The process as claimed in claim 14, wherein crystallization takes place for a period of time of from 1 to 16 hours.
24. The process of claim 23, wherein crystallization takes place for a period of from 1 to 10 hours.
25. The process of claim 23, wherein crystallization takes place for a period of from 1 to 5 hours.
26. The process of claim 14, wherein crystallization takes place at a temperature of 175°C or less.
27. A silicoaluminophosphate molecular sieve, substantially of framework type CHA, comprising within its intra-crystalline structure a template of formula (I).

28. The silicoaluminophosphate molecular sieve of claim 27, wherein the template of formula I is selected from one or more of the group consisting of N,N,N',N'-tetramethyl ethylenediamine, N,N,N',N'-tetramethyl-1,3-propanediamine, N,N,N',N'-tetramethyl-1,4-butanediamine, N,N,N',N'-tetramethyl-1,3-butanediamine, N,N,N',N'-tetramethyl-1,5-pentanediamine, N,N,N',N'-tetramethyl-1,6-hexanediamine, N,N,N',N'-tetramethyl-1,7-heptanediamine, N,N,N',N'-tetramethyl-1,8-octanediamine, N,N,N',N'-tetramethyl-1,9-nonanediamine, N,N,N',N'-tetramethyl-1,10-decanediamine, N,N,N',N'-tetramethyl-1,11-undecanediamine and N,N,N',N'-tetramethyl-1,12-dodecanediamine.

29. The silicoaluminophosphate molecular sieve of claim 28, wherein the template is selected from N,N,N',N'-tetramethyl ethylenediamine and N,N,N',N'-tetramethyl-1,4-butanediamine.

30. The silicoaluminophosphate of claim 27, further comprising fluoride within its intra-crystalline structure.

31. The silicoaluminophosphate molecular sieve of claim 30, wherein the template is N,N,N',N'-tetramethylethylenediamine.

32. An aluminophosphate or silicoaluminophosphate molecular sieve, substantially of framework type CHA, comprising within its intra-crystalline structure N,N,N',N'-tetramethyl-1,4-butanediamine.

33. The aluminophosphate or silicoaluminophosphate molecular sieve of claim 32, further comprising fluoride within its intra-crystalline structure.

34. A process for forming a catalyst composition, the process comprising forming a mixture comprising at least one molecular sieve as claimed in claim 27 and at least one formulating agent.

35. The process of claim 34, wherein the formulating agent comprises one or more materials selected from the group consisting of binding agents, matrix or filler materials and mixtures thereof.
36. The process of claim 34, wherein the molecular sieve has a Si/Al ratio of from 0.01 to 0.1.
37. The process of claim 34, wherein the molecular sieve has a Si/Al ratio of from 0.02 to 0.095.
38. The process of claim 34, wherein the molecular sieve has a Si/Al ratio of from 0.02 to 0.09.
39. The process of claim 34, wherein the molecular sieve has a Si/Al ratio of from 0.02 to 0.085.
40. A formulated molecular sieve composition comprising at least one molecular sieve as claimed in claim 27, in admixture with at least one formulating agent.
41. The formulated molecular sieve composition of claim 40, wherein the formulating agent is one or more materials selected from the group consisting of binding agents, matrix or filler materials, and mixtures thereof.
42. The formulated molecular sieve composition of claim 40, wherein the molecular sieve has a Si/Al ratio of from 0.01 to 0.1.
43. The formulated molecular sieve composition of claim 40, wherein the molecular sieve has a Si/Al ratio of from 0.02 to 0.095.
44. The formulated molecular sieve composition of claim 40, wherein the molecular sieve has a Si/Al ratio of from 0.02 to 0.09.
45. The formulated molecular sieve composition of claim 40, wherein the molecular sieve has a Si/Al ratio of from 0.02 to 0.085.

46. A process for converting a feedstock comprising organic compounds to conversion product which comprises contacting said feedstock with a catalyst comprising an active form of the microporous crystalline silicoaluminophosphate molecular sieves prepared by the process of Claim 1.

47. The process of claim 46, wherein said feedstock comprises oxygenates and said conversion product comprises one or more olefins.